

- 22 -

CLAIMS

1. An electrical heating arrangement comprising: a cooking plate (4) having an upper surface (6) for
5 receiving a cooking utensil (8), and a lower surface (10); an electric heater (12) incorporating at least one electric heating element (20), the heater being supported in contact with the lower surface of the cooking plate; and a temperature sensor assembly (30), characterised in
10 that the temperature sensor assembly comprises: an elongate substantially planar substrate (32) located in the heater and extending at least partially across the heater from a peripheral region (34) at least to a central region (36) of the heater, the substrate having
15 an upper surface (38) located in contact with, or in close proximity to, the lower surface of the cooking plate, and also a having a lower surface (66), the upper and/or lower surface or surfaces of the substrate being provided with at least one first temperature-sensitive
20 electrical resistance element (40) of film form at a first region (42) of the substrate proximate the peripheral region of the heater, the upper and/or lower surface or surfaces of the substrate being provided with at least one second temperature-sensitive electrical
25 resistance element (54; 54A; 54B) of film form at a second region (56) of the substrate proximate the central region of the heater, the first and second temperature-sensitive electrical resistance elements being provided with electrical connecting leads (44, 46, 58, 60) for
30 electrical connection to external control circuit means (28) for the heater; at least one support member (70,

- 23 -

102) secured to the substrate and underlying at least the first region of the substrate; and thermal insulation means (74) interposed between at least the lower surface of the substrate and the at least one support member
5 substantially only at the first region of the substrate.

2. An arrangement as claimed in claim 1, characterised in that the thermal insulation means (74) shields the at least one first temperature-sensitive electrical
10 resistance element (40) and a region (98) of the cooking plate (4) overlying the at least one first temperature-sensitive electrical resistance element, from direct thermal radiation from the at least one electric heating element (20).

15

3. An arrangement as claimed in claim 1 or 2, characterised in that the at least one first temperature-sensitive electrical resistance element (40) is arranged for monitoring temperature of the cooking utensil (8)
20 through the cooking plate (4).

4. An arrangement as claimed in claim 1, 2 or 3, characterised in that the at least one second temperature-sensitive electrical resistance element (54;
25 54A; 54B) is arranged for monitoring temperature of the lower surface (10) of the cooking plate (4).

5. An arrangement as claimed in any preceding claim, characterised in that at least two second temperature-
30 sensitive electrical resistance elements (54; 54A; 54B)

- 24 -

are provided on the upper and/or lower surfaces (38, 66) of the substrate (32).

6. An arrangement as claimed in any preceding claim,
5 characterised in that the upper surface (38) of the substrate (32) is arranged at a distance of 0 mm to about 3.5 mm from the lower surface (10) of the cooking plate (4).

10 7. An arrangement as claimed in any preceding claim, characterised in that the at least one support member (70, 102) is of channel form for receiving at least the first region (42) of the substrate (32) and the thermal insulation means (74).

15

8. An arrangement as claimed in claim 7, characterised in that the thermal insulation means (74) is additionally interposed between the at least one support member (70, 102) and one or more side edges of the substrate (32) at
20 the first region (42) of the substrate.

9. An arrangement as claimed in any preceding claim, characterised in that the thermal insulation means (74) comprises a thin layer of microporous thermal insulation
25 material and/or alternative thermal insulation material.

10. An arrangement as claimed in claim 9, characterised in that the alternative insulation material is selected from vermiculite, perlite, mineral fibres, calcium
30 silicate and inorganic foam, and mixtures thereof.

- 25 -

11. An arrangement as claimed in any preceding claim,
characterised in that the thermal insulation means (74)
has a thickness of from 1 mm to 10 mm between the
substrate (32) and the at least one support member (70,
5 102).

12. An arrangement as claimed in claim 11, characterised
in that the thermal insulation means (74) has a thickness
of from 2 mm to 4 mm.

10

13. An arrangement as claimed in any preceding claim,
characterised in that the first and second regions (42,
56) of the substrate (32) have substantially the same
width.

15

14. An arrangement as claimed in any of claims 1 to 12,
characterised in that the second region (56) of the
substrate (32) is narrower than the first region (42) of
the substrate.

20

15. An arrangement as claimed in any preceding claim,
characterised in that a single support member (70, 102)
underlies both the first and second regions (42, 56) of
the substrate (32).

25

16. An arrangement as claimed in claim 15, characterised
in that the support member (70, 102) is provided with one
or more apertures (104) at one or more regions thereof
underlying the second region (56) of the substrate (32)
30 and/or is provided with a coating of a material of high
thermal emissivity, whereby exposure of the second region

- 26 -

of the substrate to the effect of thermal radiation from the at least one electric heating element of the heater is maximised.

- 5 17. An arrangement as claimed in any of claims 1 to 14, characterised in that separate support members (70, 102) are provided for the first and second regions (42, 56) of the substrate (32).
- 10 18. An arrangement as claimed in any preceding claim, characterised in that the at least one support member (70, 102) comprises ceramic and/or metal.
- 15 19. An arrangement as claimed in any preceding claim, characterised in that means (100) is provided to reduce or minimise thermal conduction along the substrate (32) from the second region (56) thereof to the first region (42) thereof.
- 20 20. An arrangement as claimed in claim 19, characterised in that the means comprises providing the substrate (32) of small cross-sectional area, and/or providing the substrate with one or more apertures (104) therethrough at a location intermediate the first and second regions (42, 56) thereof and/or providing the substrate of low thermal conductivity material.
- 25 21. An arrangement as claimed in claim 20, characterised in that the substrate (32) comprises alumina, steatite, forsterite, glass-ceramic, fused silica, celsian, aluminium titanate, cordierite, zirconia, alumina-

- 27 -

zirconia blends, reaction bonded silicon nitride, or a thin metal strip provided with a coating of a dielectric material.

5 22. An arrangement as claimed in claim 21, characterised in that the substrate (32) comprises alumina of 87 to 99 percent purity.

23. An arrangement as claimed in claim 21, characterised
10 in that the substrate (32) comprises stainless steel provided with the coating of dielectric material.

24. An arrangement as claimed in any preceding claim, characterised in that the substrate (32) has a thickness
15 from about 0.25 mm to about 3 mm.

25. An arrangement as claimed in claim 24, characterised in that the substrate (32) has a thickness from about 0.5 mm to about 1 mm.

20

26. An arrangement as claimed in any preceding claim, characterised in that the substrate (32) and the support member (70, 102) extend outwardly from the heater (12) at a periphery of the heater and are secured to the heater
25 at the periphery of the heater.

27. An arrangement as claimed in claim 26, characterised in that the support member (70, 102) is secured to the heater (12) by means of a mounting bracket (80).

30

- 28 -

28. An arrangement as claimed in claim 27, characterised in that the mounting bracket (80) comprises stainless steel, plated mild steel or a high temperature resistant plastics material.

5

29. An arrangement as claimed in claim 27 or 28, characterised in that the mounting bracket (80) is arranged to bias the substrate (32) towards the lower surface (10) of the cooking plate (4).

10

30. An arrangement as claimed in claim 29, characterised in that the mounting bracket (80) is of cantilevered or spring-loaded form.

15

31. An arrangement as claimed in any preceding claim, characterised in that the electrical connecting leads (44, 46, 58, 60) for the first and second temperature-sensitive electrical resistance elements (40; 54, 54A, 54B) are of film form on the substrate (32) and extend to an end of the substrate located at a periphery of the heater (12).

20

32. An arrangement as claimed in claim 31, characterised in that the film-form electrical connecting leads (44, 46, 58, 60) are provided with electrical terminal means (48, 50, 62, 64), adapted for electrical connection to external electrically conducting leads (94, 96) leading to the external control circuit means (28).

25

30 33. An arrangement as claimed in claim 31 or 32, characterised in that the electrical connecting leads

- 29 -

(44, 46, 58, 60) of film form comprise substantially the same or similar material as the temperature-sensitive electrical resistance elements (40; 54, 54A, 54B).

- 5 34. An arrangement as claimed in any preceding claim, characterised in that the temperature-sensitive electrical resistance elements (40; 54, 54A, 54B) comprise platinum.
- 10 35. An arrangement as claimed in any preceding claim, characterised in that one or more electrically insulating or passivation layers is or are provided on the upper and/or lower surface or surfaces (38, 66) of the substrate (32) at least overlying the at least one first
15 and/or the at least one second temperature-sensitive electrical resistance element or elements 40; 54; 54A, 54B).
36. An arrangement as claimed in any preceding claim,
20 characterised in that the substrate (32) is secured to the at least one support member (70, 102) by rivets, bolts or pins (78).
37. An arrangement as claimed in any preceding claim,
25 characterised in that the cooking plate (4) comprises glass-ceramic material.